FOREWORD

IN his celebrated *Traite de Metallurgie* in 1875, Gruner gave this definition:

" Metallurgy is the *Art* which treats of the preparation of metals."

To-day, the application of the laws of physical chemistry, and above all the application to metallurgical processes of the principles set forth by M. Le Chatelier, have enabled us to uncover the mysteries of this art. Metallurgy has become a science. The dense fog of empiricism, which formerly enveloped all of the metallurgical processes, has been dispersed, and everything has become simple and clear, as it does in all other branches of human knowledge, when they become part of the domain of science.

It is true that we now require a much more profound theoretical preparation than was required in former times of those who took up metallurgical work. As a result, the young engineer at the termination of his studies enters the workshop with such a clear idea of its processes that after a few months of practical experience he is much better able to make himself the master of the situation than are the older students of Gruner—who acquired the metallurgical *art*—after ten years of practice and assiduous work in the shops.

The young man of our day, who is well prepared theoretically, becomes familiar with his work ten times as rapidly and works to better advantage than those who studied under the old system. Armed with scientific truths, he copes much more readily with the difficulties which arise, and he does not experience the feeling of helplessness which overcame the older metallurgists when they found it impossible to better working conditions and save the plant from a serious loss—a feeling which often paralyzed our efforts at the time when all of our energies were vitally necessary.

The book which we present to our readers is dedicated to the methods of constructing more efficient fuel-fired furnaces. Here-